ICE BODY MAKER COLLECTING BIN CONTROL

14 Claims, 19 Drawing Figs:

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Field of Search ........................................ 62/137,
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References Cited

UNITED STATES PATENTS
2,778,198 1/1957 Heath .......................... 62/137
2,077,820 4/1937 Arp .............................. 62/344X

ABSTRACT: An ice body maker having a mold in which ice bodies are formed with means for ejecting the ice bodies to a collecting bin along a preselected path. A control is provided including a holding means which interrupts the movement of the ice bodies along the ejection path to hold them in spaced relationship to the collecting space, permitting them to dry. During this drying period a sensing portion of the control moves through the collecting space to sense the level of ice bodies therein for automatically maintaining a preset level. During movement of the sensing portion of the control through the collecting space, the holding means prevents the ice bodies being ejected from the mold from falling onto the sensing portion, thereby preventing them from being raked from the bin defining the collecting space by the sensing portion should the bin be removed from the ice body maker. The control is adjustable to permit different preset levels of ice bodies in the collecting space to be obtained as desired. The adjustment of the control may be maintained by means of a retaining member.
ICE BODY MAKER COLLECTING BIN CONTROL

BACKGROUND OF THE INVENTION

1. Field of the Invention
This invention relates to ice body makers and in particular to controls for automatically controlling the operation thereof to maintain a preselected level of predried ice bodies in a collecting bin associated therewith. The control further prevents accidental ejection of ice bodies from the bin upon subsequent removal thereof from the ice body maker.

2. Description of the Prior Art
In one form of improved ice body maker disclosed in Linstromberg U.S. Pat. No. 3,280,578, owned by the assignee of the instant invention, a mold is provided with an ejecting means for transferring the formed bodies to a subjacent collecting bin. In Heath U.S. Pat. No. 2,778,198, also owned by the assignee hereof, an ice-making machine is disclosed having a modified form of level-sensing means wherein intercepting members are operated by the control concurrently operating the sensing arm to hold the relatively wet ice bodies for a period of time before delivery thereof to the subjacent collecting bin.

SUMMARY OF THE INVENTION
The present invention comprehends an improved means for controlling the transfer of ice bodies in an ice body maker. In the structure disclosed herein, an elongate control element is provided having different portions providing a number of different coordinated functions whereby an improved control of the ice body transfer is obtained. Thus, in the present invention, the elongate control element includes a first portion selectively interrupting the transfer of the ice bodies from the mold to the collecting space whereby the ice bodies may be held to permit refreezing thereof after removal from the mold so that they will be substantially completely dry when they are delivered to the collecting space.

The control element further includes a sweep portion spaced from the holding portion by a connecting portion. The holding portion retains the ice bodies during the time the sweep portion moves through the collecting space to sense the level of ice bodies therein and thus prevents pileup of the ice bodies on the sweep portion during the sensing cycle. As a result of the improved holding function, the transferred ice bodies are prevented from being raked from the collecting space by the sweep portion should the bin, defining said collecting space, be subsequently removed from association with the ice body maker.

The present invention further comprehends providing such a control element with means for permitting selective adjustment so as to maintain different preselected levels of ice bodies in the collecting space, as desired by the user. The adjusting means is manually operable to permit facilitated adjustment and readjustment as desired. One highly desirable advantage of this feature is the adaptability of the control for use with different sized collecting bins. Such adjustability is also advantageous where the ice body maker is installed by the user in the field.

The improved control is extremely simple and economical of construction, while yet providing the desired features discussed above.

More specifically, the invention comprehends an improved means for controlling the transfer of ice bodies in an ice body maker having a mold in which ice bodies are formed, means defining a collecting space subjacent the mold, and means for transferring the formed ice bodies along a preselected path from the mold to the collecting space. The transfer-controlling means is defined by an elongate control element having a holding portion, a sweep portion, and a connecting portion connecting the sweep portion to the holding portion. Operating means is provided for selectively disposing the holding portion in a first position blocking said preselected path for interrupting the transfer of the ice bodies, thereby maintaining the ice bodies spaced from the collecting space for a predetermined time period, and concurrently moving the sweep portion through the collecting space to sense the level of ice bodies already present in the collecting space. After the predetermined time, the operating means moves the holding portion from the first position to permit completion of the transfer of the ice bodies to the collecting space and disposes the sweep portion out of the path followed by the ice bodies during their transfer to the collecting bin.

Further, more specifically, the invention comprehends the provision of a deformable connecting portion permitting adjustment of the disposition of the sweep portion relative to the holding portion. The invention also comprehends provision of a retaining member for holding the sweep portion in the adjusted position relative to the holding portion whereby the sweep portion may be adjusted to sense any one of a plurality of different levels of collected ice bodies in the collecting space.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

FIG. 1 is a fragmentary perspective view of a refrigerator apparatus having an ice body maker embodying the invention, portions being broken away to facilitate illustration of the invention;
FIG. 2 is a perspective view of the ice body maker;
FIG. 3 is a traverse vertical section of the apparatus of FIG. 2;
FIG. 4 is a perspective view of an ice body as formed in the ice body maker illustrated in FIG. 2;
FIG. 5 is a traverse vertical section similar to FIG. 3 showing the ice body maker as at the initiation of an ejection cycle;
FIG. 6 is a diagrammatic section similar to that of FIG. 5 at a subsequent portion of the ejection cycle;
FIG. 7 is a diagrammatic section similar to that of FIG. 5 at a further subsequent portion of the ejection cycle with the ice bodies partially removed from the mold cavity;
FIG. 8 is a diagrammatic section similar to that of FIG. 5 at a further subsequent portion with the ice bodies transferred from the ejector to a resting shelf portion;
FIG. 9 is a diagrammatic section similar to that of FIG. 5 with the ice bodies being released from the resting shelf to fall into the collecting space;
FIG. 10 is an elevation of the connector element shown in FIG. 3 for holding the control in any one of a plurality of preselected adjusted positions; and
FIG. 11 is an enlarged side elevation of the ice body maker illustrating a modified form of the invention;
FIG. 12 is a fragmentary perspective view of the mold of the ice body maker;
FIG. 13 is an enlarged side elevation of the ice body maker with portions broken away to facilitate illustration of the invention;
FIG. 14 is a side elevation similar to that of FIG. 13 but showing the modified form of control means of FIG. 11;
FIG. 15 is a diagrammatic vertical section of the apparatus of FIG. 14 as at the initiation of an ejection cycle;
FIG. 16 is a diagrammatic section similar to that of FIG. 15 at a subsequent portion of the ejection cycle;
FIG. 17 is a diagrammatic section similar to that of FIG. 15 at a further subsequent portion of the ejection cycle with the ice body partially removed from the mold cavity;
FIG. 18 is a diagrammatic section similar to that of FIG. 15 at a further subsequent portion with the ice body transferred from the ejector to a resting shelf portion; and
FIG. 19 is a diagrammatic section similar to that of FIG. 15 with the ice bodies being released from the resting shelf to fall into the collecting space.
DESCRIPTION OF THE PREFERRED EMBODIMENT

In the exemplary embodiment of the invention as disclosed in the drawing, an ice body maker generally designated 10 is shown to be installed in a refrigeration apparatus 11 of conventional construction. Apparatus 11 may include a cabinet 12 defining a refrigerator space 13 and a freezer space 14. Controlled access to spaces 13 and 14 may be had by suitable doors 15 and 16 respectively. Refrigeration may be effected by suitable means, herein illustratively comprising a compressor 17, a condenser 18, a capillary 9 and conduits 20 and 21 for delivering refrigerant to and from an evaporator 22 provided within the cabinet 12. Freezer space 14 is maintained at a below freezing temperature whereby water delivered to the ice body maker 10 through a conventional water solenoid 23 may be frozen into ice bodies which are automatically harvested.

The icemaker 10 as shown in FIG. 2 includes a mold 29 in which the ice bodies 30 (FIG. 4) are formed and from which the ice bodies are ejected to a subjacent bin 25 defining a collecting space 26 (FIG. 1) by means of an ejector 31 which sweeps through the mold during the ejection cycle. The ejection member swings the ice bodies out of mold 29 and against a stripping member 32 which effectively strips the ice bodies from the ejector 31 and causes them to fall downwardly into the collecting bin 25. Cyclical operation of ejector 31 is automatically effected by a control generally indicated 27 disposed at the forward end of the mold 29. In addition to cycling the ejector 31, control 27 further automatically provides for refilling of the mold for subsequent further ice body formation therein, in the event that the level of ice bodies in the subjacent bin 25 is below a preselected full level. For a detailed description of the operation of control 27, reference may be had to the hereinbefore identified Linstromberg U.S. Pat. No. 3,280,578. Mold 29 defines a plurality of upwardly opening cavities 33 in which ice bodies are formed. The water from which the ice bodies are formed is delivered to mold 29 by means of an inlet 34 connected to solenoid-operated valve 23 (FIG. 1) through a suitable delivery tube. Valve 23 is connected to a suitable source of water under pressure (not shown).

Referring to FIGS. 2, 3, and 12; mold 29 herein more specifically comprises a tray structure having a bottom wall 35 and sidewalls 36 and 37. A chilled heating element 44 is pressed into bottom wall 35 to heat the mold during the ejection operation, thus aiding in said ejection operation. A plurality of partition walls 38 extend transversely across the mold to define with the above-described tray walls the cavities 33 in which ice bodies are formed. Herein each cavity 33 is partially divided by a partial dividing wall 39, which extends transversely across the cavity as best seen in FIG. 12. Each of the partition walls and dividing walls is provided with a recessed upper edge portion through which water flows from the end cavity successively forward to the respective cavities until all cavities are filled to a level L as shown in FIG. 3. Thus, the recessed edge portion of respective partition and dividing walls over which the water flows effectively form a plurality of weirs over which a small body or bridge of connecting ice forms during the freezing operation. As shown in FIG. 12, however, the recess 40 in the upper edge of the partial dividing wall 39 is substantially larger than the recess 41 in the partition wall 38. Thus, the connecting portion of ice which forms in the space defined by recess 40 is substantially larger than the connecting length of ice which forms in the recess defined by opening 41. Thus, a connecting ice portion 42 is formed on ice body 30 the protective shown in FIG. 4. Connecting portion 42 is preferably sufficiently strong to prevent breaking of the ice body during the normal ejection and resulting from their free fall into collecting bin 25 the connecting portions 42 being sufficiently strong to preclude breakage as from such impact forces. Thus, the mold as shown in FIG. 12 produces bifurcated ice bodies as shown in FIG. 4. In order to sense the level of ice bodies 30 as they accumulate in bin 25, this invention comprehends the provision of a novel sensing arm structure 28 actuated by control 27 for controlling the automatic harvesting operation so as to maintain a preseleced level of ice bodies in collecting space 26 as desired by the user. The control 27 operates the sensing arm 28 through a connecting portion 45, as best seen in FIGS. 3 and 11. The sensing arm 28 includes a holding portion 46, a sweep portion 47, and a connecting portion 48 which, as seen in FIG. 11, effectively define a generally U-shaped structure wherein the holding portion 46, and sweep portion 47 define the legs of the U-shaped structure and the connecting portion 48 defines the bight of the U-shaped structure.

As shown, holding portion 46 may be substantially rectilinear and extend adjacent the stripper 32 of the mold 29 onto which the ice bodies 30 are delivered during an intermediate stage of the ejection cycle. The sweep portion 47 is arcuate and the connection portion 48 is also arcuate. The arcuate configuration of connection portion 48 and sweep portion 47 effects an improvement over prior-art sensing arm structure as follows: Should the user of the icemaker remove bin 25 from the freezer compartment by sliding it in the direction indicated by arrow 56, edge 57 of bin 25 contacts an arcuate portion of sensing arm 28. This allows the arm to easily ride up over edge 57 and thus not catch thereon or rake ice bodies from bin 25.

The sensing arm may be formed of a suitable strong material such as a metal rod or wire, and in the illustrated embodiment is formed of stainless steel having a spring temper. Further, illustratively, the sweep portion 47 may have a relatively large arcuate radius varying from approximately 3/8 inches adjacent the connecting portion 35 to approximately 4 inches adjacent the distal end 49 thereof. The connecting portion 48 may have an arcuate radius of approximately 1/4 inches and may include an upturned arcuate portion 50 extending from the distal end 51 of the holding portion 46. As seen in FIG. 11, the sweep portion 47 extends downwardly into the collecting space 26 while the distal end 49 is juxtaposed to the holding portion 46 adjacent the connection 45.

As shown in FIG. 11, the distal portion 49 may be adjustably spaced from the holding portion 46 by means of a connector strap 52 which connects end 49 to holding portion 46. As shown in FIG. 10, the connector strap 52 includes a plastic element having a pair of apertures 53 and 54 at the opposite ends thereof. Aperture 53 is preferably slightly larger than the cross section of the sensing arm 28 to permit facilitated movement of the strap 52 onto the holding portion 46 from the distal end 49 thereof. The distal end 49 is inserted into the smaller aperture 54 whereby the spacing of end 49 from the holding portion 46 may be retained by the canted locking engagement of the strap 52 with the respective rod portions 46 and 49. A protective cap 55 may be installed on the end of the rod 28.

The operation of sensing arm 28 with the ice body maker 10 may best be understood by reference to FIGS. 5—9 of the drawings. Thus, as shown in FIG. 5, the ice-harvesting operation is initiated by counterclockwise rotation of the ejector 31 as seen herein, with the sensing arm 28 disposed in a lowermost level-sensing position within the bin space 26. As ejector 31 continues to rotate, the sensing arm 28 is swung outwardly from the collecting bin 25, as shown in FIG. 6. Continued rotation of ejector 31 causes it to forcibly engage the upper surface 56 of the ice bodies and urge the ice bodies outwardly from the mold cavities 33 in a pivotal movement, as shown in FIG. 7. At the end of this movement, control 27 causes the sensing arm 28 to swing back downwardly into the collecting space 26. At the position of FIG. 7 wherein the ejector fingers have moved approximately 270° from the start position, the control 27 brings the sensing arm substantially fully to the lowestmost sensing position.
As shown in FIG. 8, the continued rotation of ejector 31 now brings the ice bodies 30 outwardly from the mold cavities 33 whereupon the ice bodies are stripped from ejector 31 by placing the mold 28 into the submerging space 26. Thus, the ice bodies 30 in the adjacent collecting space 26 are blocked by the holding portion 46, and ice bodies 30 remain on top of stripper 32, as shown in FIGS. 8 and 11. Thus, the ice bodies are held on stripper 32 for a shot period of time while any melt formed thereon as a result of heating of the mold in the ejection cycle tends to refreeze whereby the ice bodies are dried before completion of the transfer from the mold to the collecting bin 15. Further, the holding portion 46 prevents the ice bodies from falling into the collecting space 26 prior to the movement outwardly of the sensing arm 28, as shown in FIG. 9, during the final portion of the harvesting operation. This effectively precludes the ice bodies 30 from piling up on sweep portion 47 during the ejection operation. Should such "piling up" be permitted, ice bodies 30 might be accidentally raked from bin 25 upon its removal from freezer compartment 14.

As shown in FIG. 9, the ejector 31 continues to rotate back to the starting position of FIG. 5 while the sensing arm 28 is again brought down into the collecting space 26 subsequent to the delivery of the ice bodies 30 thereinto to sense the new level of ice bodies in space 26. In the event that the level reaches the preselected level, the movement of the sweep portion 47 of the improved sensing arm 28 is arrested thereby preventing further cycling of the ice body maker 10 until such time as the level is lowered as by the removal of ice bodies from the collecting bin 26 whereupon the arm may move to the lowermost position to initiate a subsequent ice body making and harvesting operation.

To adjust the ice body maker to provide any one of a plurality of different levels of ice bodies in the collecting bin 25, the user may merely bend the connecting portion 48 to raise or lower the sweep portion 47 as desired (assuming that adjusting strap 52 is not used). Thus, as illustrated in FIG. 11, the connecting portion 48 may be bent to enlarge the radius thereof and lower the sweep portion 47 to the dotted line position providing a lower level of ice bodies in the collecting bin 25. Alternatively, the adjusting strap 52 may be employed, as shown in FIG. 11, to retain the sweep portion 47 in any one of a plurality of different positions to obtain the desired adjustment of the level. The strap 52 may be suitably adjusted by movement of the distal end 49 of sweep portion 47 further into or outwardly of the aperture 54 with the adjusted position of the connecting portion 48 being held by the frictional engagement of the strap with the sensing arm portions 46 and 47 in the respective apertures. Thus, not only does the strap 52 provide a means for adjusting the distal end 49 of the arm 28 to the holding portion 46 to vary the disposition of the lowermost portion of the sweep portion 47, but it also stabilizes the sensing arm structure by effectively causing the sweep portion 47 to be connected to the upper portion of the sensing arm at each of the opposite ends thereof.

Where the adjustment of the disposition of sweep portion 47 is effected simply by suitably bending the connecting portion 48, the material of which sensing arm 28 is formed is preferably controlably deformable to permit the adjusted disposition to be maintained against the forces acting on the sensing arm in the normal sensing operations while yet the bending of the connecting portion 48 may be manually effected for facilitated adjustment by a user, such as a housewife. Where the connector strap 52 is utilized, the sensing arm material may be somewhat less rigid.

Thus, the ice body maker 10 provides an improved control of the transfer of the ice bodies from the mold to the collecting space in the harvesting operation. The improved control includes means for interrupting the transfer of the ice bodies sufficiently to assure a drying thereof before delivery to the collecting space and provides improved means for permitting variation in the preselected level of ice bodies in the collecting space, as desired by the user. The improved sensing arm further assures that the ice bodies will not pile up thereon during the ejection operation resulting in their accidental expulsion from the collecting bin should it be removed from the freezing compartment. The sensing arm structure is simple and economical of construction, while yet providing the above-discussed desirable features.

While we have shown and described certain embodiments of our invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as defined in the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed as defined as follows:

1. In an ice body maker having a mold in which ice bodies are formed, a collecting bin subjacent said mold, an ejector for ejecting formed ice bodies from said mold, and means for transferring said formed ice bodies along a preselected path from said mold to said collecting bin, means for controlling the transfer of said ice bodies and arresting the operation of said ice body maker when the level of ice bodies in said bin rises above a predetermined level comprising: an elongate control element having a holding portion, a sweep portion, and a connecting portion connecting said sweep portion rigidly to said holding portion; and means for selectively disposing said control element with said holding portion in a first position across said path to comprise a means for interrupting the transfer of said ice bodies and maintaining the ice bodies spaced from said collecting bin, and for moving said holding portion from said first position to permit completion of the transfer of said ice bodies to said collecting bin, said disposing means acting through said holding portion and said connecting portion to move said sweep portion through said collecting bin prior to the transfer to sense the level of ice bodies collected therein and to dispose said sweep portion out of said collecting bin during the transfer of said ice bodies to said collecting bin whereby accumulation of the ice bodies on said sweep portion during the transfer of said ice bodies is prevented.

2. The ice body maker controlling means of claim 1 wherein said element comprises a one piece, formed wire.

3. The ice body maker controlling means of claim 1 wherein said element comprises a U-shaped wire, said holding and sweep portions comprising the legs thereof and said connecting portion comprising the bight thereof.

4. The ice body maker controlling means of claim 1 wherein said connecting portion defines adjustable means for varying the disposition of said sweep portion whereby the predetermined level at which ice bodies are maintained in said bin may be selectively varied.

5. The ice body maker controlling means of claim 1 wherein said connecting portion is controlably manually bendable for varying the disposition of said sweep portion relative to said holding portion whereby the predetermined level at which ice bodies are maintained in said bin may be selectively varied.

6. The ice body maker controlling means of claim 1 wherein said holding portion is rectilinear.

7. The ice body maker controlling means of claim 1 wherein said sweep portion is arcuate.

8. The ice body maker controlling means of claim 1 wherein said connecting portion is arcuate.

9. The ice body maker controlling means of claim 1 wherein said sweep portion has a distal end spaced from said holding portion and said controlling means further includes means connecting said distal end to said holding portion.

10. The ice body maker controlling means of claim 1 wherein said sweep portion has a distal end spaced from said holding portion and said controlling means further includes means for adjustably connecting said distal end to said holding portion to adjust the path of movement of said sweep portion through said collecting space thereby to sense any one of a plurality of different predetermined levels of ice bodies therein.
11. The ice body maker controlling means of claim 1 wherein said sweep portion has a distal end spaced from said holding portion and said controlling means further includes a connector element adjustably connecting said distal end to said holding portion.

12. The ice body maker controlling means of claim 11 wherein said connector element comprises a strap having a first portion retained on said holding portion and a second portion retained on said holding portion and a second portion retained on said sweep portion.

13. The ice body maker controlling means of claim 11 wherein said connector element comprises a strap having a first aperture receiving said holding portion and a second aperture receiving said sweep portion.

14. The ice body maker controlling means of claim 1 wherein said sweep portion has a distal end spaced from said holding portion and said controlling means further includes a flexible plastic member adjustably connecting said distal end to said holding portion.